



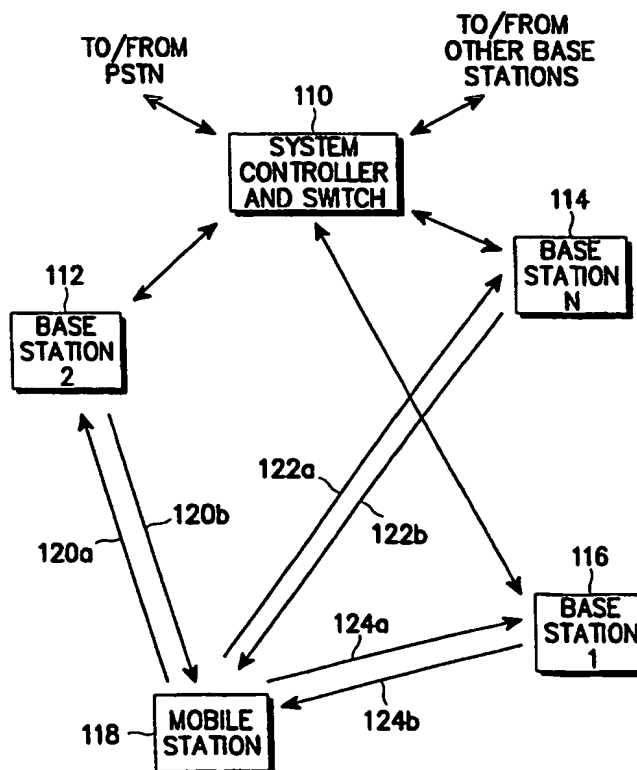
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> : <b>H04B 1/707</b>		A1	(11) International Publication Number: <b>WO 99/00911</b>
			(43) International Publication Date: 7 January 1999 (07.01.99)
(21) International Application Number: PCT/KR98/00187		(81) Designated States: AU, CA, CN, JP, KR, RU, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).	
(22) International Filing Date: 26 June 1998 (26.06.98)			
(30) Priority Data: 60/050,869 26 June 1997 (26.06.97) US 08/998,343 24 December 1997 (24.12.97) US		Published With international search report.	
(71) Applicant: SAMSUNG ELECTRONICS CO., LTD. [KR/KR]; 416, Maetan-dong, Paldal-gu, Suwon-shi, Kyungki-do 442-370 (KR).			
(72) Inventors: KIM, Young, Ky; Sunkyung Apt., 12-1491, Daechi-dong, Kangnam-gu, Seoul 135-280 (KR). AHN, Jae, Min; Samho Apt., 109-303, Ilwon-doong, Kangnam-gu, Seoul 135-230 (KR). KANG, Hee, Won; Dong-A Apt., 102-902, Myunmok-dong, Choongrang-gu, Seoul 131-200 (KR).			
(74) Agent: LEE, Keon, Joo; Mihwa Building, 110-2, Myongryun-dong, 4-ga, Chongro-gu, Seoul 110-524 (KR).			

(54) Title: ASYMMETRIC CHANNEL ALLOCATION FOR A MOBILE STATION IN A CDMA COMMUNICATION NETWORK

## (57) Abstract

In a CDMA-based communication system, a system and method for allocating channel bandwidths and chip rates. The system and method supports asymmetric bandwidths and chip rates for the forward and reverse channels. The system and method includes a negotiation process between a mobile station and a base station to select chip rates and bandwidths for use in the forward and reverse channels.



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

- 1 -

**ASYMMETRIC CHANNEL ALLOCATION FOR A MOBILE STATION  
IN A CDMA COMMUNICATION NETWORK**

**FIELD OF THE INVENTION**

The present invention generally relates to code  
5 division multiple access (CDMA) communication systems and  
more particularly, to a system and method for allocating  
different bandwidth and chip rates to the forward and  
reverse channel links.

**BACKGROUND OF THE INVENTION**

10 One type of cellular communication system employs a  
technology known as CDMA (code division multiple access).  
In this system, users are distinguished from one another  
by unique codes assigned to them while sharing the same  
frequency band at the same time. CDMA converts  
15 information to be transmitted into a spread spectrum  
signal by multiplying the information by a pseudo random  
number (PN). This is what spreads the spectrum. The  
pseudo random number is a digital piece of data that, for  
all intents and purposes, appears to be entirely random.  
20 This PN is synchronized to the system in the CDMA mobile  
station by a pilot carrier sent from the base station.  
The rate at which the PN sequence is generated is known  
as the PN chip rate. For further description of CDMA and  
the differences between CDMA, TDMA (time division  
25 multiple access), and FDMA (frequency division multiple  
access), please see "Code Division Multiple Access, "  
Communications, Feb. 1990, by Fred Baumgartner, hereby  
incorporated by reference.

- 2 -

Figure 1 graphically illustrates a CDMA-based communication system comprising a mobile station 10, a base station 20, reverse link 30 which represents the electromagnetic wave communication link transmitted from mobile station 10 to base station 20 and forward link 40 which represents the electromagnetic wave communication link transmitted from base station 20 to mobile station 10.

Current mobile stations used in wireless communications have symmetric forward and reverse channel bandwidths and corresponding symmetric chip rates. The term "symmetric" means that the bandwidths for the forward and reverse channels are the same and that the chip rates in the forward and reverse directions are the same. A CDMA standard, W-CDMA, has recently been proposed to accommodate high speed data (HSD) communication service over an air or wireless link. The HSD service may include various applications such as Internet access, electronic mail service, multimedia applications where more throughput is required for the forward channel than for the reverse channel, etc. Many of these services, such as multimedia applications, require asymmetric bandwidths for the forward and reverse directions. The term "asymmetric" means that the PN chip rates on the forward and reverse links are different from each other.

In present CDMA-based communication systems, all of the mobile stations have symmetric bandwidths for the forward and reverse links. The call setup procedure between a mobile station and a base station is accomplished over a symmetric forward and reverse link. After the call setup procedure is completed, a call is

- 3 -

maintained on the same forward/reverse channel. Figure 2 illustrates asymmetric channel allocation for the forward and reverse channels wherein  $F_0$  (forward link channel frequency) does not equal  $F_1$  (reverse link channel frequency) and  $BW_0$  (forward link channel bandwidth) is equal to  $BW_1$  (reverse link channel bandwidth). Both call setup and call maintenance are performed over the  $F_0$ ,  $F_1$  band.

What is needed are mobile stations that accommodate high speed data communication services by supporting asymmetric forward and reverse channel allocation.

#### SUMMARY OF THE INVENTION

Accordingly, the present invention provides a system and method for allocating asymmetric forward and reverse channels in a CDMA-based communication system. The present invention provides a system and method for allocating asymmetric bandwidths and chip rates to the forward and reverse channels.

The present invention also provides a negotiation process between a mobile station and a base station for selecting an optimal bandwidth to be utilized by the mobile station for receiving transmitted information from a base station.

Further, the present invention provides a code division multiple access (CDMA) system comprising a base station operating to support a basic chip rate, a forward channel link chip rate, and a reverse channel link chip rate ; and a mobile station in electronic communication with the base station, the mobile station communicating

- 4 -

with the base station so as to independently adjust the values of the forward channel link chip rate and the reverse channel link chip rate. The forward channel link chip rate may be less than or equal to a maximum forward value allowed by the base station. The reverse channel link chip rate may be less than or equal to a maximum reverse value allowed by the base station. In addition, the forward channel link chip rate, the reverse channel link chip rate, and the basic chip rate may be equal to each other. The base station may transmit the maximum forward and/or reverse values to the mobile station. In addition, the forward channel link chip rate may be less than or equal to a maximum forward value allowed by the mobile station. Further, the reverse channel link chip rate may be less than or equal to a maximum reverse value allowed by the mobile station. In either case, the mobile station may transmit the maximum forward and/or reverse value to the base station.

The present invention also provides a method of operating a CDMA system comprising the steps of setting up a call to a base station operating to support a basic chip rate, a maximum forward channel link chip rate, and a maximum reverse channel link chip rate by paging the base station with a mobile station; requesting a desired forward channel link chip rate from the base station by the mobile station; transmitting the maximum forward channel link chip rate to the mobile station from the base station; transmitting a revised forward channel link chip rate to the base station from the mobile station; transmitting a start message to the mobile station from the base station ; and communicating with the base station using the revised forward channel link chip rate. During the use of this method, the revised forward

- 5 -

channel link chip rate may be equal to the basic chip rate. In addition, the revised forward channel link chip rate may be equal to the maximum forward channel link chip rate.

5           In addition, the method of operating a CDMA system may further comprise the steps of requesting a desired reverse channel link chip rate from the base station by the mobile station ; transmitting the maximum reverse channel link chip rate to the mobile station from the  
10 base station; transmitting a revised reverse channel link chip rate to the base station from the mobile station ; and communicating with the base station using the revised reverse channel link chip rate. In this case, the revised reverse channel link chip rate may be equal to the basic  
15 chip rate. Further, the maximum reverse channel link chip rate may be equal to the basic chip rate. The basic chip rate may also be equal to the revised forward channel link chip rate and the revised reverse channel link chip rate. The basic chip rate may also be equal to the  
20 maximum forward channel link chip rate and the maximum reverse channel link chip rate.

          The present invention also provides a method of operating a CDMA system comprising the steps of setting up a call to a mobile station operating to support a  
25 basic chip rate, a maximum forward channel link chip rate, and a maximum reverse channel link chip rate by paging a mobile station with a base station; requesting a desired forward channel link chip rate from the mobile station by the base station; transmitting the maximum  
30 forward channel link chip rate to the base station from the mobile station; transmitting a revised forward channel link chip rate to the mobile station from the

- 6 -

base station; transmitting a start message to the base station from the mobile station; and communicating with the mobile station using the revised forward channel link chip rate. The revised forward channel link chip rate may  
5 be equal to the basic chip rate, and/or may be equal to the maximum forward channel link chip rate. This method may further comprise the steps of requesting a desired reverse channel link chip rate from the mobile station by the base station from the mobile station; transmitting  
10 the maximum reverse channel link chip rate to the base station from the mobile station; transmitting a revised reverse channel link chip rate to the mobile station from the base station; and communicating with the mobile station using the revised reverse channel link chip rate.  
15 In this case, the basic chip rate may be equal to the revised reverse channel link chip rate, and/or the maximum reverse channel link chip rate. In addition, the basic chip rate may be equal to the revised forward channel link chip rate and the reverse channel link chip  
20 rate, and/or the maximum forward channel link chip rate and the maximum reverse channel link chip rate.

One advantage of the present invention is the increased flexibility provided for frequency allocation in a base station.

25 Another advantage of the present invention is the ability to accommodate asymmetric high speed data services, such as wireless multimedia applications.

The present invention also provides the advantage of increased efficiency of frequency usage.

30

**BRIEF DESCRIPTION OF THE DRAWINGS**

- 7 -

Figure 1 is a prior art graphical representation of a CDMA-based communication system.

Figure 2 is an amplitude-vs-frequency graph of the forward and reverse channels having symmetrical  
5 bandwidths.

Figure 3 is a schematic overview of an exemplary CDMA-based communication network in accordance with the present invention.

Figure 4 is an amplitude-vs-frequency graph of the  
10 forward and reverse channel frequency allocations during and after the call setup procedure according to the present invention.

Figure 5 is a flowchart illustrating a chip rate/bandwidth negotiation process according to the  
15 present invention.

#### DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

An exemplary telephone system in which the present invention is embodied is illustrated in Figure 3. The  
20 system utilizes CDMA modulation techniques in communication between the system mobile stations, units or telephones, and the cell-sites or base stations. Cellular systems in large cities may have hundreds of cell-site stations serving hundreds of thousands of  
25 mobile telephones. The use of CDMA techniques readily facilitates increases in user capacity in systems of this size as compared to conventional FM modulation cellular systems.

- 8 -

In Figure 3, system controller and switch 110, also referred to as mobile telephone switching office (MTSO), typically includes interface and processing circuitry for providing system control to the cell-sites or base stations. Controller 110 also controls the routing of telephone calls from the public switched telephone network (PSTN) to the appropriate base station for transmission to the appropriate mobile station. Controller 110 also controls the routing of calls from the mobile stations, via at least one base station to the PSTN. Controller 110 may direct calls between mobile users via the appropriate base stations, since such mobile stations do not typically communicate directly with one another.

Controller 110 may be coupled to the base stations by various means such as dedicated telephone lines, optical fiber links or by microwave communication links. It will be appreciated that system controller and switch 110 may be integrated with any number of base stations. In Figure 3, three such exemplary base stations 112, 114, and 116 along with an exemplary mobile station 118, which includes a cellular telephone, are illustrated. Arrows 120a-120b define communication links between the base station 112 and the mobile station 118. Arrows 122a-122b define communication links between the base station 114 and the mobile station 118. Similarly, arrows 124a-124b define communication links between the base station 116 and the mobile station 118.

The cell-site or base station service areas, or cells, are designed in geographic shapes such that the mobile station will normally be closest to one cell-site. When the mobile station is idle, i.e., no calls in

- 9 -

progress, the mobile station constantly monitors the pilot signal transmissions from each nearby base station. As illustrated in Figure 3, the pilot signals are respectively transmitted to mobile station 118 by base stations 112, 114, and 116, respectively, upon forward communication links 120b, 122b, and 124b. The mobile station then determines which cell it is in by comparing pilot signal strength transmitted from these particular cell-sites.

10           In the example illustrated in Figure 3, mobile station 118 may be considered closest to base station 116. When mobile station 118 initiates a call, a control message is transmitted to the nearest base station, base station 116. Base Station 116, upon receiving the call request message, signals system controller 110 and transfers the call number. System controller 110 then connects the call through the PSTN to the intended recipient.

20           According to the invention, mobile stations for high speed data service should support the asymmetric nature of that service. In other words, the mobile stations should support asymmetric forward and reverse link channels by adjusting the chip rates of the mobile station. The chip rates of the mobile station may be changed by varying the speed of the PN sequence generator. For further description of the mobile station components, please see the TIA/EIA/IS-95A Standard (herein incorporated by reference). The set of asymmetric forward and reverse channels of the present invention includes the use of symmetric forward and reverse channels as a special case. In order to comply with the W-CDMA standard, the bandwidth for the forward and

- 10 -

reverse channels may have values equal to integer multiples of a basic bandwidth value. For example, the basic bandwidth of IS-95-based CDMA systems is typically 1.2288 MHz. For operations such as the soft handoff procedure, mobile stations may utilize a basic forward/reverse channel combination having, for example, bandwidths equal to 1.2288 MHz.

Referring now to Figure 4 as an example of asymmetrical channel allocation, a graph of channel allocations according to the present invention is illustrated for both during and after the call setup procedure. The bandwidths of bands 210 (forward channel bandwidth - symmetric) and 220 (reverse channel bandwidth - symmetric) which are centered at frequencies  $F_0$  (initial forward link channel frequency) and  $F_1$  (initial reverse link channel frequency) are the same. The bandwidths of bands 230 (forward channel bandwidth-asymmetric) and 240 (reverse channel bandwidth-asymmetric), centered at frequencies  $F_2$  (revised forward link channel frequency) and  $F_3$  (revised reverse channel link frequency), may be different, that is, asymmetrical. The call setup procedure may be accomplished through bands 210 and 220 to negotiate the forward/reverse link channel bandwidth after call setup. The chip rate for each direction (reverse and forward) is negotiated between the base station and the mobile station over bands 210 and 220. The mobile station selects the maximum chip rate available for each direction wherein the selected rate is supported by the mobile station. The mobile station then sets the selected rate for both directions for bands 230 (asymmetric forward link channel bandwidth) and 240 (asymmetric reverse link channel bandwidth). The negotiation process

- 11 -

is accomplished over bands 210 and 220. At the end of negotiation, the mobile station transfers the call from bands 210 and 220 into bands 230 and 240. After the transfer operation, the call is maintained over bands 230 and 240. If the base station supports only a basic chip rate (non-variable), then the call should be maintained over the first band pair 210 and 220.

Referring to Figure 5, a flowchart illustrating a chip rate/bandwidth negotiation process according to the present invention will be described. In step 305, the mobile station sets up a call with a basic chip rate, such as 1.2288 MHz. In step 310, the mobile station (MS) sends a chip rate request to the base station (BS) for the forward and reverse channels. In step 315, the MS receives a response from the BS with information about allowable chip rates for the forward and reverse channels. In step 320, the MS sends an acknowledge message to the BS. The BS also prepares the resources for the revised forward and reverse channel chip rates, and sends a start message to the MS. In step 325, the MS starts to communicate with the BS through the newly-assigned chip rates for the forward and reverse channels.

Although the present invention and its advantages have been described in detail, it should be understood that various changes, substitutions and alterations can be made herein without departing from the spirit or scope of the invention as defined in the appended claims.

- 12 -

## WHAT IS CLAIMED IS :

1. A code division multiple access (CDMA) system comprising:

5 a base station operating to support a basic chip rate, a forward channel link chip rate, and a reverse channel link chip rate ; and

10 a mobile station in electronic communication with said base station, said mobile station communicating with said base station so as to independently adjust the values of said forward channel link chip rate and said reverse channel link chip rate.

2. The CDMA system set forth in claim 1, wherein said forward channel link chip rate is less than or equal to a maximum forward value allowed by said base station.

15 3. The CDMA system set forth in claim 1, wherein said reverse channel link chip rate is less than or equal to a maximum reverse value allowed by said base station.

20 4. The CDMA system set forth in claim 1, wherein said forward channel link chip rate and said reverse channel link chip rate are equal.

5. The CDMA system set forth in claim 1, wherein said basic chip rate, said forward channel link chip rate , and said reverse channel link chip rate are equal.

25 6. The CDMA system set forth in claim 2, wherein said base station transmits the maximum forward value to said mobile station.

7. The CDMA system set forth in claim 3, wherein

- 13 -

said base station transmits the maximum reverse value to said mobile station.

8. The CDMA system set forth in claim 1, wherein said forward channel link chip rate is less than or equal  
5 to a maximum forward value allowed by said mobile station.

9. The CDMA system set forth in claim 1, wherein said reverse channel link chip rate is less than or equal  
to a maximum reverse value allowed by said mobile  
10 station.

10. The CDMA system set forth in claim 8, wherein said mobile station transmits the maximum forward value to said base station.

11. The CDMA system set forth in claim 9, wherein  
15 said mobile station transmits the maximum reverse value to said base station.

12. A method of operating a CDMA system comprising the steps of :

setting up a call to a base station operating to  
20 support a basic chip rate, a maximum forward channel link chip rate, and a maximum reverse channel link chip rate by paging said base station with a mobile station;

requesting a desired forward channel link chip rate from said base station by said mobile station;

25 transmitting said maximum forward channel link chip rate to said mobile station from said base station;

transmitting a revised forward channel link chip rate to said base station from said mobile station;

transmitting a start message to said mobile station

- 14 -

from said base station ; and

communicating with said base station using said revised forward channel link chip rate.

13. The method of operating a CDMA system as set  
5 forth in claim 12, wherein said revised forward channel link chip rate is equal to said basic chip rate.

14. The method of operating a CDMA system as set  
forth in claim 12, wherein said revised forward channel link chip rate is equal to said maximum forward channel  
10 link chip rate.

15. The method of operating a CDMA system as set forth in claim 12, further comprising the steps of :

requesting a desired reverse channel link chip rate from said base station by said mobile station;

15 transmitting said maximum reverse channel link chip rate to said mobile station from said base station ;

transmitting a revised reverse channel link chip rate to said base station from said mobile station ; and

communicating with said base station using said  
20 revised reverse channel link chip rate.

16. The method of operating a CDMA system as set forth in claim 15, wherein said revised reverse channel link chip rate is equal to said basic chip rate.

17. The method of operating a CDMA system as set  
25 forth in claim 15, wherein said maximum reverse channel link chip rate is equal to said basic chip rate.

18. The method of operating a CDMA system as set forth in claim 15, wherein said basic chip rate is equal

- 15 -

to said revised forward channel link chip rate and said revised reverse channel link chip rate.

19. The method of operating a CDMA system as set forth in claim 15, wherein said basic chip rate is equal  
5 to said maximum forward channel link chip rate and said maximum reverse channel link chip rate.

20. A method of operating a CDMA system comprising the steps of :

setting up a call to a mobile station operating to  
10 support a basic chip rate, a maximum forward channel link chip rate, and a maximum reverse channel link chip rate by paging said mobile station with a base station ;

requesting a desired forward channel link chip rate from said mobile station by said base station ;

15 transmitting said maximum forward channel link chip rate to said base station from said mobile station;

transmitting a revised forward channel link chip rate to said mobile station from said base station;

transmitting a start message to said base station  
20 from said mobile station ; and

communicating with said mobile station using said revised forward channel link chip rate.

21. The method of operating a CDMA system as set forth in claim 20, wherein said revised forward channel  
25 link chip rate is equal to said basic chip rate.

22. The method of operating a CDMA system as set forth in claim 20, wherein said revised forward channel link chip rate is equal to said maximum forward channel link chip rate.

- 16 -

23. The method of operating a CDMA system as set forth in claim 20, further comprising the steps of :

requesting a desired reverse channel link chip rate from said mobile station by said base station ;

5 transmitting said maximum reverse channel link chip rate to said base station from said mobile station;

transmitting a revised reverse channel link chip rate to said mobile station from said base station ; and

10 communicating with said mobile station using said revised reverse channel link chip rate.

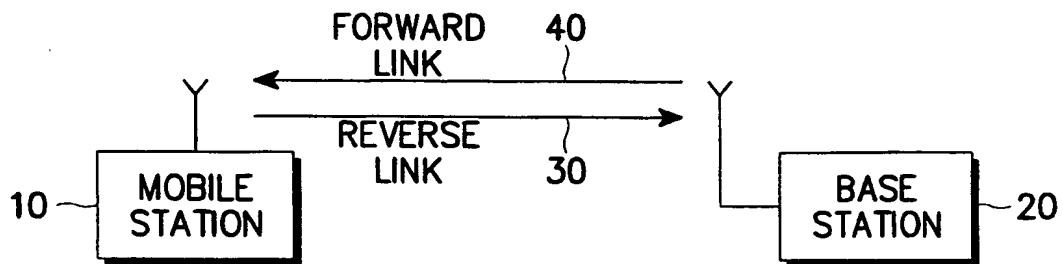
24. The method of operating a CDMA system as set forth in claim 23, wherein said revised reverse channel link chip rate is equal to said basic chip rate.

25. The method of operating a CDMA system as set forth in claim 23, wherein said maximum reverse channel link chip rate is equal to said basic chip rate.

26. The method of operating a CDMA system as set forth in claim 23 wherein said basic chip rate is equal to said revised forward channel link chip rate and said reverse channel link chip rate.

27. The method of operating a CDMA system as set forth in claim 23, wherein said basic chip rate is equal to said maximum forward channel link chip rate and said maximum reverse channel link chip rate.

1/4



(PRIOR ART)  
FIG. 1

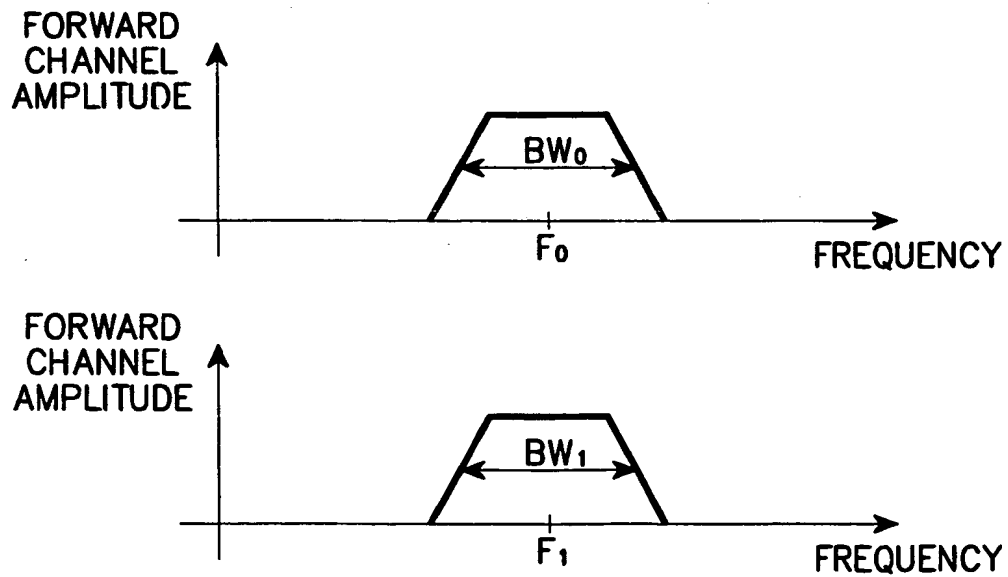


FIG. 2

2/4

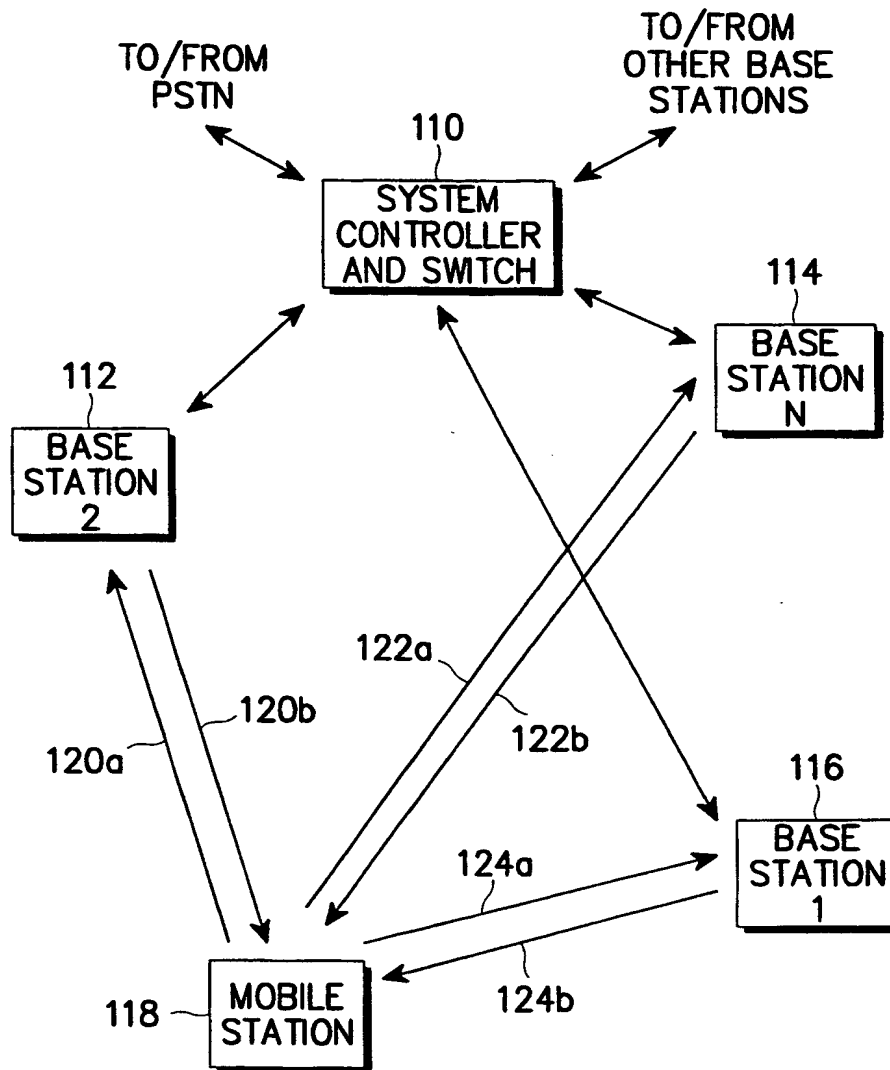


FIG. 3

3/4

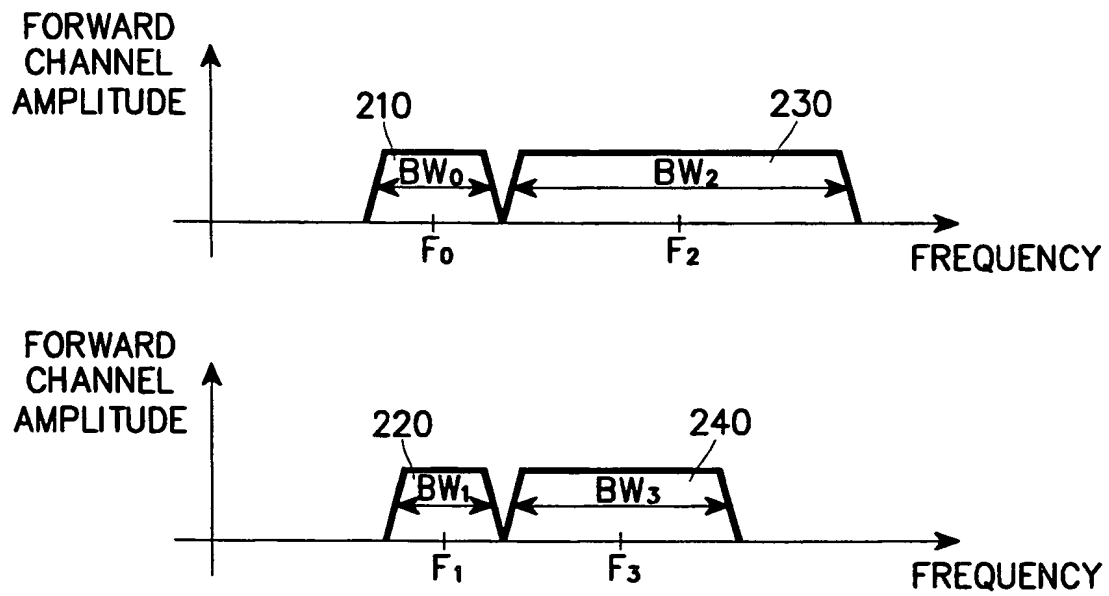


FIG. 4

4/4

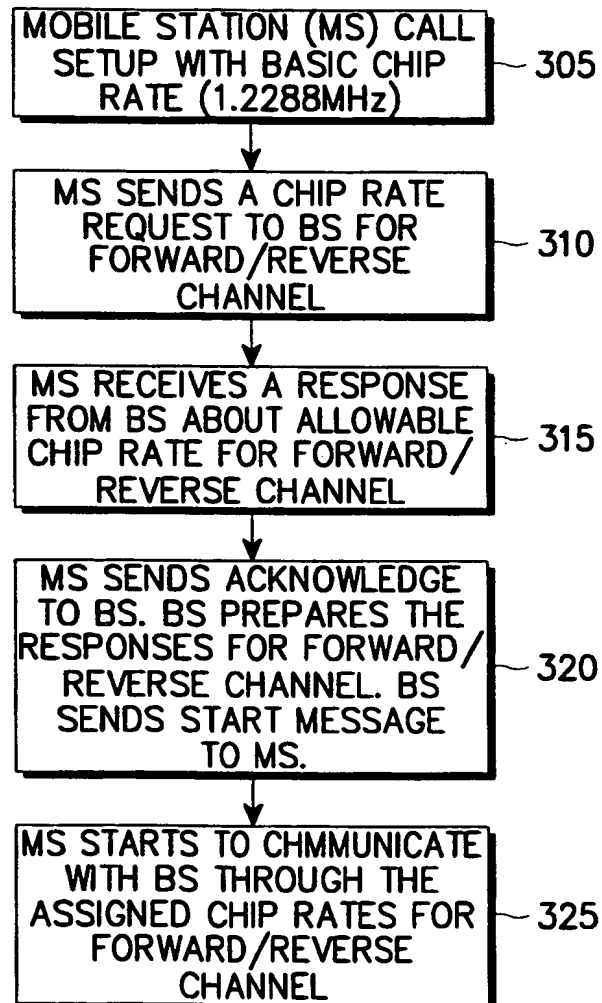


FIG. 5

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/KR 98/00187

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC <sup>6</sup> : H 04 B 1/707 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC <sup>6</sup> : H 04 B 1/69, 1/707, 7/005; H 04 J 13/00, 13/04 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) WPI		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 365 550 A (ROBERSON) 15 November 1994 (15.11.94), fig.1; column 2, lines 27-29; column 3, lines 10-15.	1,12,20
A	US 5 452 327 A (BARHAM) 19 September 1995 (19.09.95), fig.2; abstract; column 4, lines 3-9; column 4, lines 65-68.  -----	1,12,20
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 01 September 1998 (01.09.98)		Date of mailing of the international search report 08 September 1998 (08.09.98)
Name and mailing address of the ISA/ Austrian Patent Office Kohlmarkt 8-10; A-1014 Vienna Facsimile No. 1/53424/535		Authorized officer Dröscher Telephone No. 1/53424/320

Form PCT/ISA/210 (second sheet) (July 1998)

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR 98/00187

Im Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
US A 5345550	15-11-94	keine - none - rien	
US A 5452327	19-09-95	keine - none - rien	